

Género

Candida

Profesora Asistente Dra. Loreto Abusleme R.

Área de Microbiología

Departamento de Patología y Medicina Oral

loreto.abusleme@odontología.uchile.cl

Candidiasis y las levaduras del género *Candida*

- Candidiasis: infección por hongos más frecuente del territorio BMF, afecta piel y mucosas
- Causada por levaduras unicelulares del género *Candida*

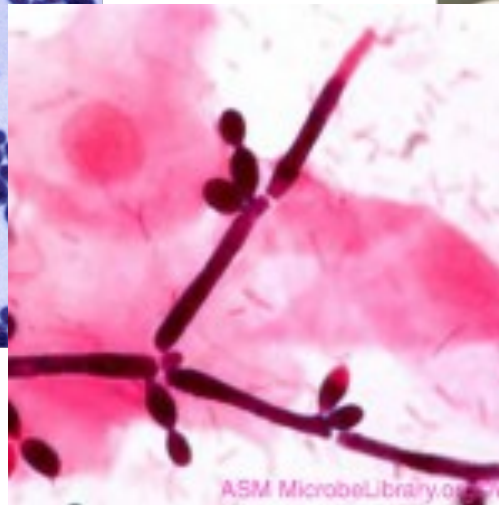
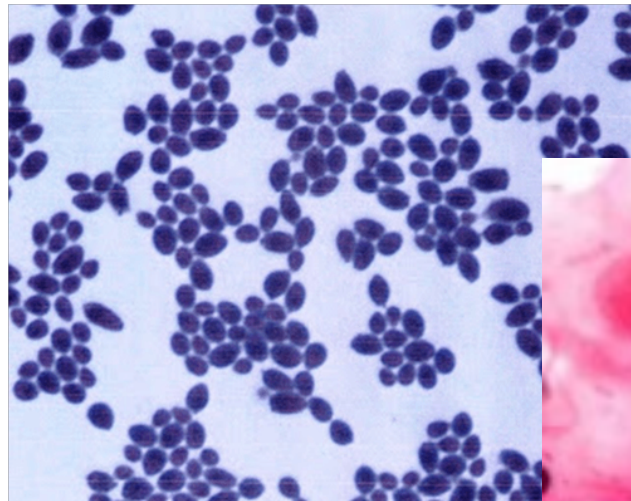


Candida albicans



Levaduras del género *Candida* - ¿ Quiénes son ?

- Hongos unicelulares
- Aspecto microscópico
- Agentes etiológicos de candidiasis BMF y diseminadas (órganos profundos/ sistémicas)



Taxonomía género *Candida*

Family/genus or clade	Species	Genetic markers
Debaryomycetaceae		
<i>Lodderomyces/Candida albicans</i>	<u><i>C. albicans</i></u> , <i>C. blackwelliae</i> ^{a,c} , <i>C. bohioensis</i> ^c , <i>C. buenavistaensis</i> , <i>C. chauliodes</i> , <i>C. corydali</i> , <u><i>C. dubliniensis</i></u> , <i>C. frijolesensis</i> , <i>C. gigantensis</i> , <i>C. hyderabadensis</i> ^a , <i>C. jiufengensis</i> ^a , <i>C. labiduridarum</i> , <i>C. maltosa</i> , <u><i>C. metapsilosis</i></u> ^a , <i>C. morakotiae</i> ^a , <i>C. neerlandica</i> , <u><i>C. orthopsilosis</i></u> , <i>C. oxycetoniae</i> ^a , <i>C. parapsilosis</i> , <i>C. prachuapensis</i> ^a , <i>C. pseudojiufengensis</i> ^a , <i>C. sakaeoensis</i> ^a , <i>C. sanyaensis</i> ^a , <i>C. saraburiensis</i> ^a , <i>C. sojiae</i> , <i>C. tetrigidarum</i> , <i>C. theae</i> ^a , <u><i>C. tropicalis</i></u> , <i>C. verbasci</i> , <i>C. viswanathii</i>	SSU, D1/D2 LSU
<i>Candida glabrosa</i> clade	<i>C. fluviatilis</i> , <i>C. glabrosa</i> , <i>C. manassasensis</i> , <i>C. palmioleophila</i> , <i>C. pseudoglabrosa</i> , <i>C. saitoana</i> , <i>C. sphagnicola</i>	SSU, D1/D2 LSU
<i>Candida kruisii</i> clade	<i>C. aglyptini</i> ^c , <i>C. atbi</i> , <i>C. barrocoloradensis</i> , <i>C. cretensis</i> , <i>C. gatunensis</i> , <u><i>C. kruisii</i></u> , <i>C. lycoperdinae</i> , <i>C. pallodes</i> , <i>C. panamensis</i> , <i>C. stri</i> , <i>C. tritomae</i>	SSU, D1/D2 LSU
<i>Candida tanzawaensis</i> clade	<i>C. ambrosiae</i> , <i>C. anneliseae</i> , <i>C. atakaporum</i> , <i>C. bokatorum</i> , <i>C. bolitotheri</i> , <i>C. bibrorum</i> , <i>C. canberraensis</i> , <i>C. chickasaworum</i> , <i>C. choctaworum</i> , <i>C. emberorum</i> , <i>C. guaymorum</i> , <i>C. kunorum</i> , <i>C. maxii</i> , <i>C. panamericana</i> , <i>C. prunicola</i> , <i>C. pyralidae</i> , <i>C. taliae</i> , <i>C. tanzawaensis</i> , <i>C. terraborum</i> , <i>C. vadensis</i> ^a , <i>C. wounanorum</i> , <i>C. xylopsoci</i> , <i>C. yuchorum</i>	SSU, D1/D2 LSU

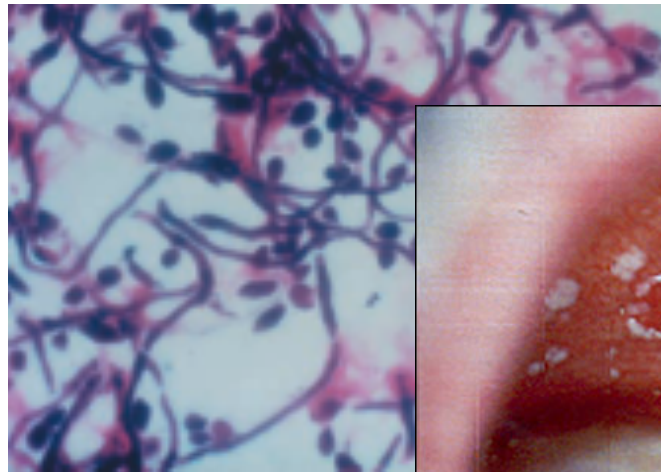
Candida spp.: especies de hongos más frecuentes en la cavidad oral

Candida albicans
corresponde a más del
80% de los aislados de
cultivos de este género

Table 9.1 Fungal species recovered from the human mouth.	
<i>Candida</i> species	Other fungal species (rare)
<i>Candida albicans</i>	<i>Paracoccidioides brasiliensis</i>
<i>Candida glabrata</i>	<i>Aspergillus</i> spp.
<i>Candida tropicalis</i>	<i>Cryptococcus neoformans</i>
<i>Candida krusei</i>	<i>Histoplasma capsulatum</i>
<i>Candida lusitaniae</i>	<i>Mucor</i> spp.
<i>Candida dubliniensis</i>	<i>Saccharomyces</i> spp.
<i>Candida kefyr</i>	<i>Geotrichum</i> spp.
<i>Candida guilliermondii</i>	<i>Rhizopus</i> spp.
<i>Candida parapsilosis</i>	

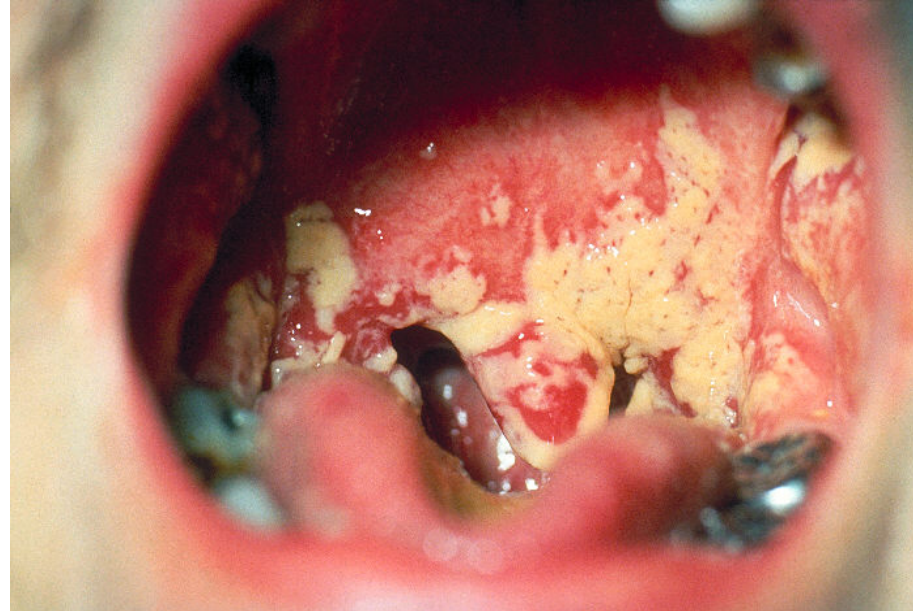
Levaduras del género *Candida* - Hábitat

- Parte de la microbiota comensal
- Colonizan asintómicamente piel y mucosas
- Hasta un 60% de los adultos sanos presenta *C. albicans* en la cavidad oral y un 26-65% de los niños sanos

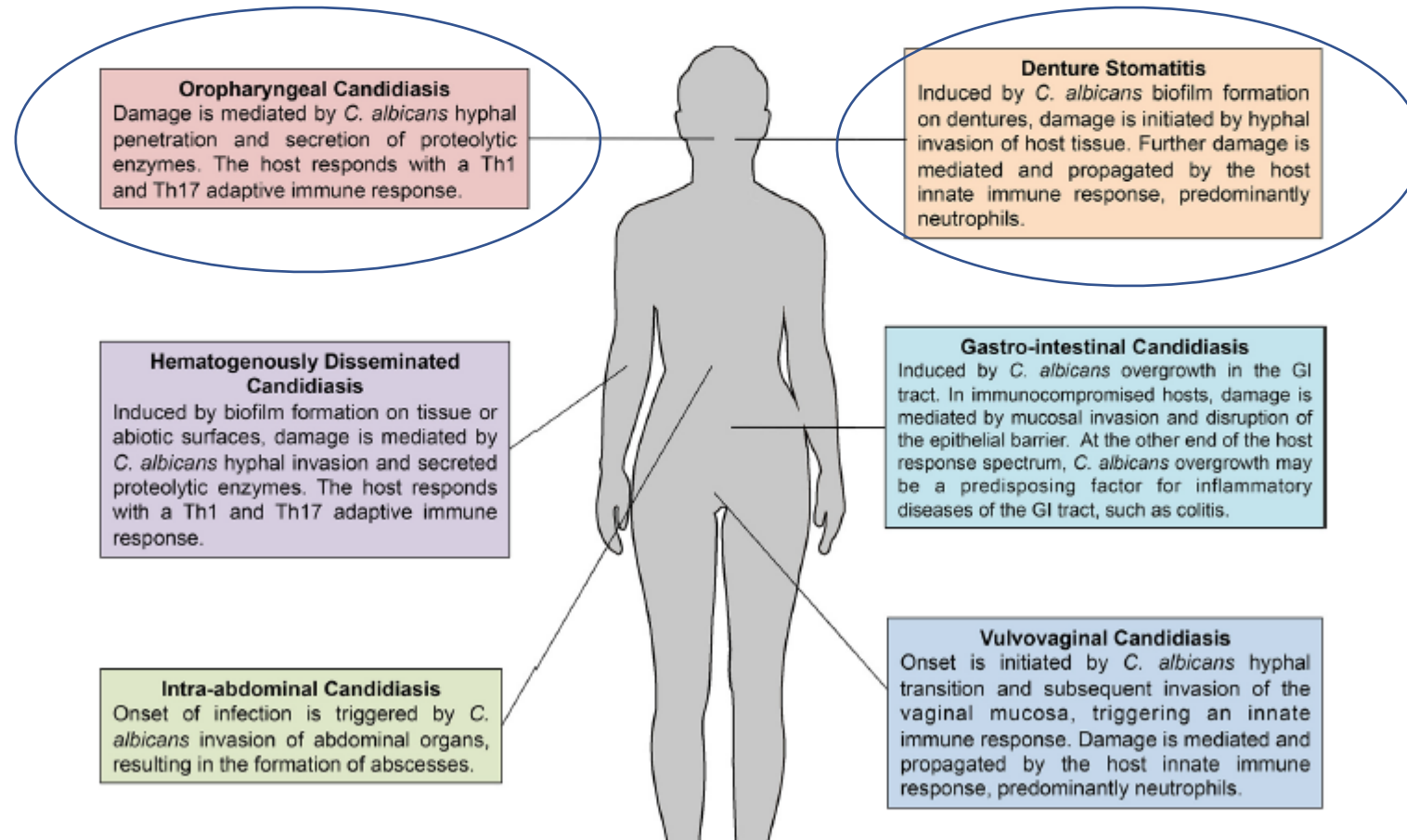


Levaduras del género *Candida* - Importancia

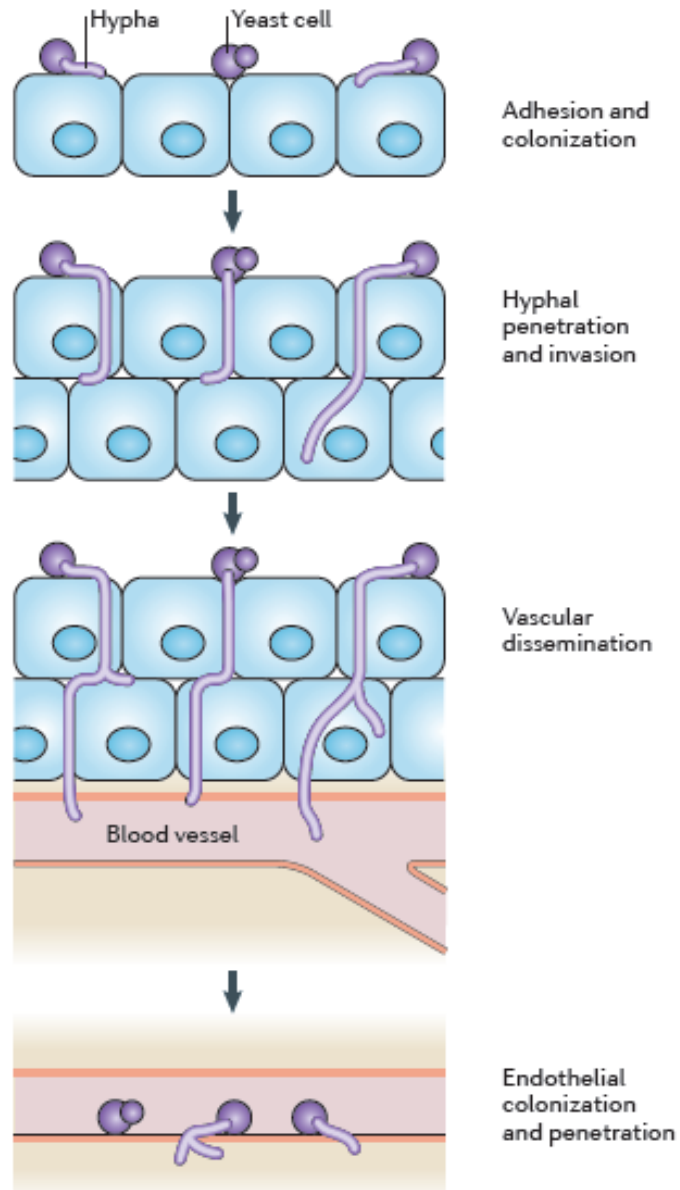
- Candidiasis – infección micótica oportunista más frecuente en el hospedero humano
- Factores propios del hospedero son determinantes
- Es el principal agente de infecciones nosocomiales



Cambio de estado de salud y enfermedad asociado a *Candida*



Diseminación hematológica de levaduras del género *Candida*



- Causan infecciones sistémicas en pacientes debilitados .
- Tercera causa de infecciones del torrente sanguíneo en UCI con alta mortalidad 35- 60%
- La especie aislada con mayor frecuencia es *albicans*, pero han emergido otras especies
- Se ha observado un cambio epidemiológico entre la especie *albicans* y otras junto a su patrón de susceptibilidad

**TABLE
6-1**

Clinical Forms of Oral Candidiasis

Clinical Type	Appearance and Symptoms	Common Sites	Associated Factors and Comments
Pseudomembranous (thrush)	Creamy-white plaques, removable; burning sensation, foul taste	Buccal mucosa, tongue, palate	Antibiotic therapy, immunosuppression
Erythematous	Red macules, burning sensation	Posterior hard palate, buccal mucosa, dorsal tongue	Antibiotic therapy, xerostomia, immunosuppression, idiopathic
Central papillary atrophy (median rhomboid glossitis)	Red, atrophic mucosal areas; asymptomatic	Midline posterior dorsal tongue	Idiopathic, immunosuppression
Chronic multifocal	Red areas, often with removable white plaques; burning sensation, asymptomatic	Posterior palate, posterior dorsal tongue, angles of mouth	Immunosuppression, idiopathic
Angular cheilitis	Red, fissured lesions; irritated, raw feeling	Angles of mouth	Idiopathic, immunosuppression, loss of vertical dimension
Denture stomatitis (chronic atrophic candidiasis, denture sore mouth)	Red, asymptomatic	Confined to palatal denture-bearing mucosa	Probably not true infection; denture often is positive on culture but mucosa is not
Hyperplastic (candidal leukoplakia)	White plaques that are not removable; asymptomatic	Anterior buccal mucosa	Idiopathic, immunosuppression; care must be taken not to confuse this with other keratotic lesions with superimposed candidiasis
Mucocutaneous	White plaques, some of which may be removable; red areas	Tongue, buccal mucosa, palate	Rare; inherited or sporadic idiopathic immune dysfunction
Endocrine-candidiasis syndromes	White plaques, most of which are not removable	Tongue, buccal mucosa, palate	Rare; endocrine disorder develops after candidiasis

- Formas clínicas variadas de Candidiasis Oral
- Micosis superficiales de tipo oportunista

Factores asociados al desarrollo de Candidiasis oral

Sistémicos	
Edades extremas	
Condiciones que generan inmuno-compromiso	
Enfermedades metabólicas (diabetes)	
Infecciones concurrentes	Locales
Terapias con antibacterianos	Uso prolongado de corticoides (orales y/o inhaladores)
Radioterapia	Hipofunción de glándulas salivales
	Flujo salival disminuído
	Dieta rica en carbohidratos
	Fumar

Pacientes susceptibles a desarrollar Candidiasis oral

- Personas mayores
- Particularmente aquellas institucionalizadas y portadoras de prótesis removible



Cambios en el ecosistema oral asociados al envejecimiento

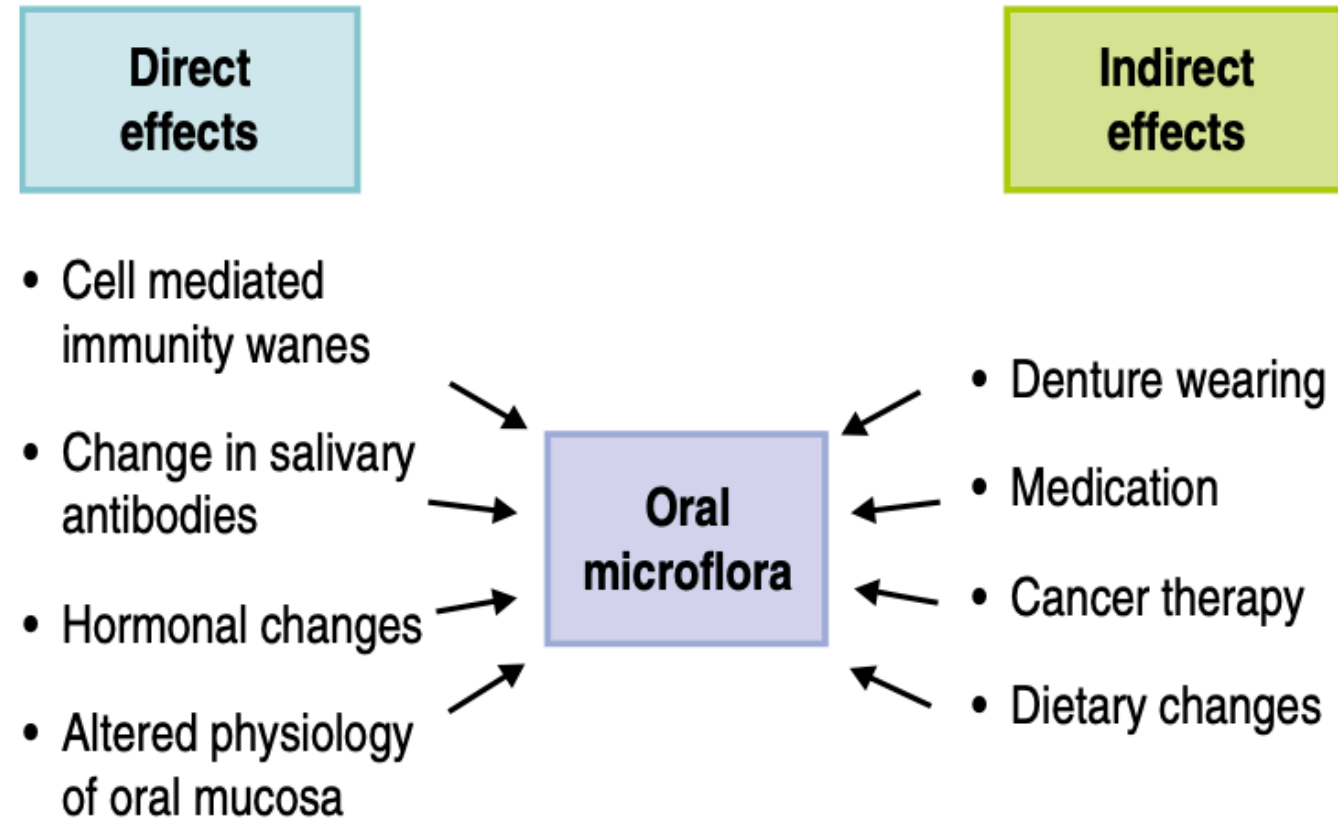


Fig. 4.3 Direct and indirect effects of ageing on the oral microflora.

C. albicans especie recuperada con mayor frecuencia en Candidiasis Oral

- Consenso en la literatura que en diversas poblaciones *C. albicans* es la especie recuperada con mayor frecuencia de estas infecciones

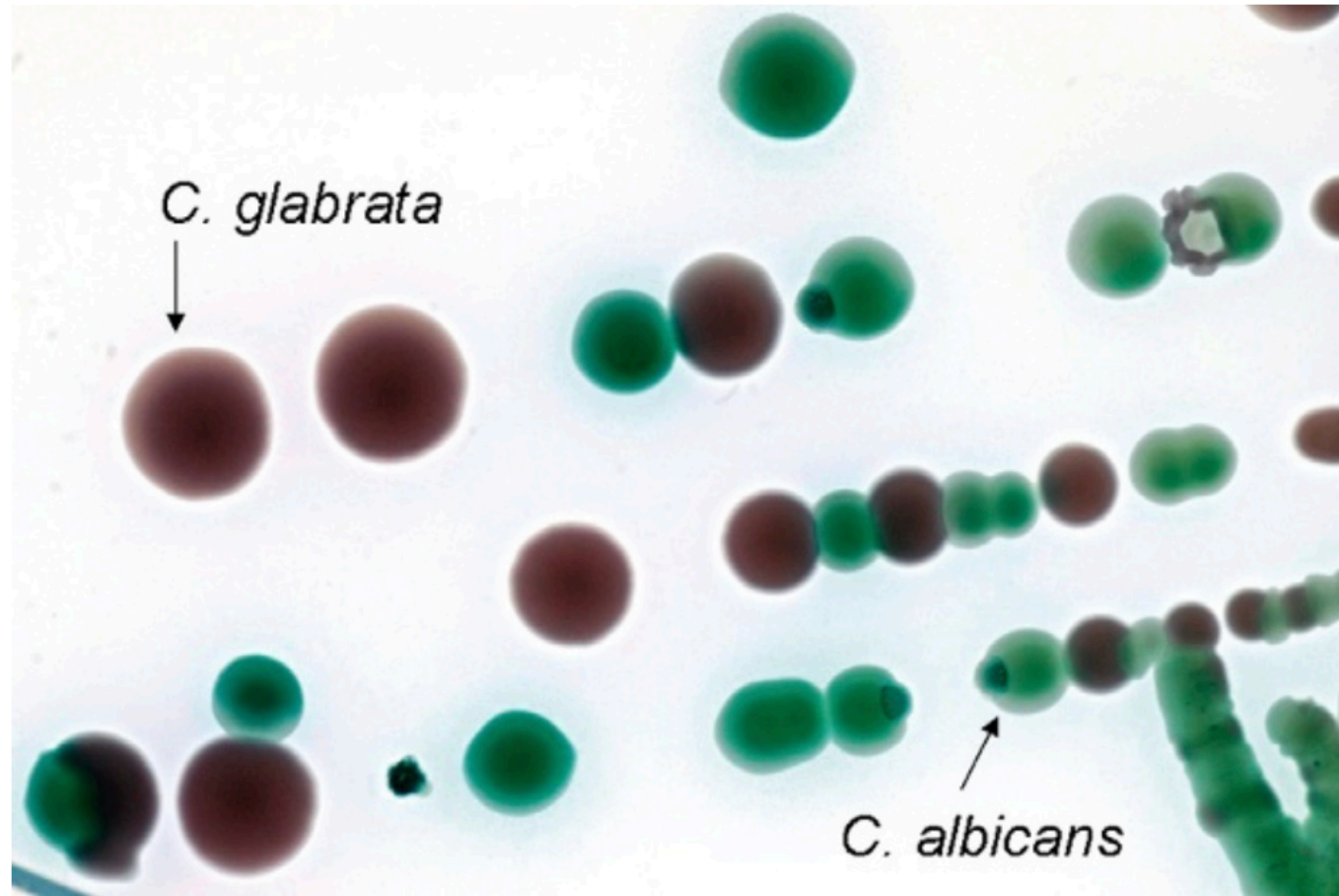
Results: In total, 9769 (6.09%) of the 160,357 patients screened were diagnosed with oral candidiasis on the basis of both clinical manifestations and laboratory testing. The ratio of females to males was 1:0.61, and females had higher overall infection rates than males in all age subgroups. Patients with HIV infection, anaemia-related stomatitis, Sjögren's syndrome/xerostomia, pemphigoid, and radiation-induced stomatitis were highly susceptible to oral candidiasis. Of the 11,161 isolated *Candida* strains, *C. albicans* remained the most common species (75.37%), followed by *C. tropicalis* (6.06%), *C. krusei* (2.79%), and *C. glabrata* (2.02%). Surprisingly, both the proportion and the number of *C. glabrata* isolates increased dramatically over the 4 consecutive years.

Técnicas para el diagnóstico de levaduras del género *Candida*

Table 9.4 Methods of recovering *Candida* from the oral cavity.

Isolation method	Advantages	Disadvantages
Culture of whole saliva	Sensitive; viable organisms isolated	Problems may occur with collection of sample; not site specific
Concentrated oral rinse	Quantitative; viable cells isolated	Some patients have difficulty in using rinse; not site specific
Swab	Simple to use; viable cells isolated; site specific	Difficult to standardise
Smear	Simple to use; not reliant on culture	Viable cells not determined; species identity not readily confirmed
Imprint culture	Quantitative; viable cells isolated; site specific	Some sites difficult to sample
Biopsy	Essential for chronic hyperplastic candidosis	Invasive; not appropriate for other forms of candidosis

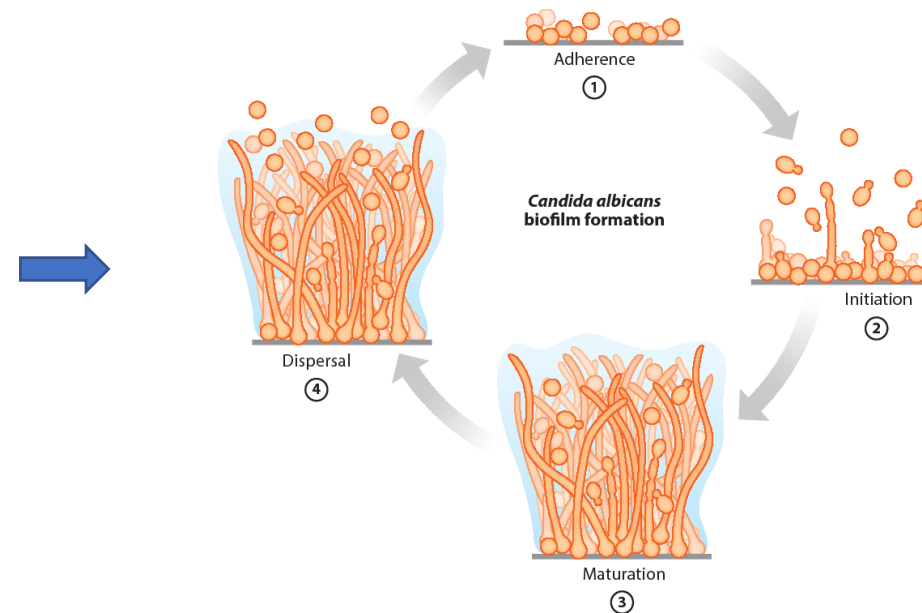
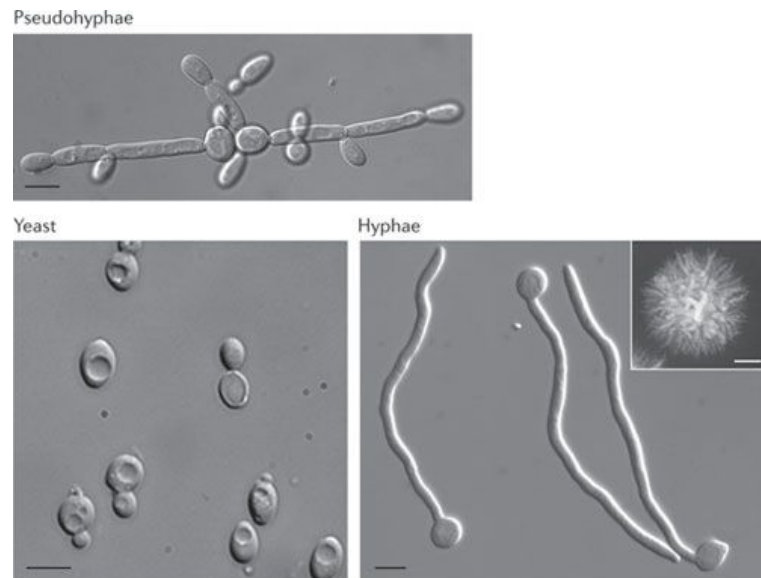
Técnicas para el diagnóstico de levaduras del género *Candida*



CHROMagar *Candida*

¿ Qué determina el cambio del comensalismo a parasitismo ?

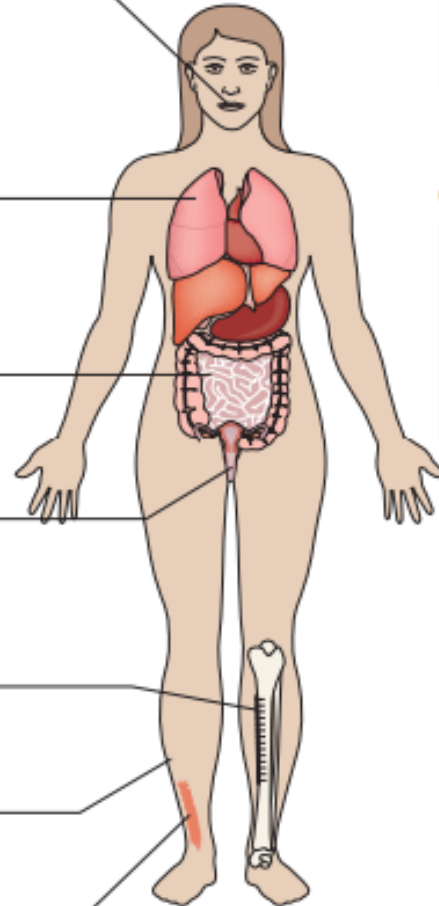
- Cambios en el medioambiente oral en el hospedero (locales/sistémicos), disminuyen los mecanismos de inmunológicos de vigilancia y control
- *Candida albicans* genera su transición fenotípica, gatillando cambio de estado de **comensal** a **patogénico**
- Formación de biopelículas es clave, junto con otros mecanismos de patogenicidad



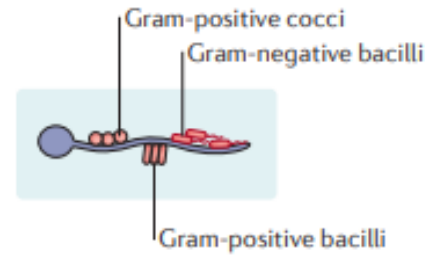
Estructuración de biopelículas de *C. albicans*

a

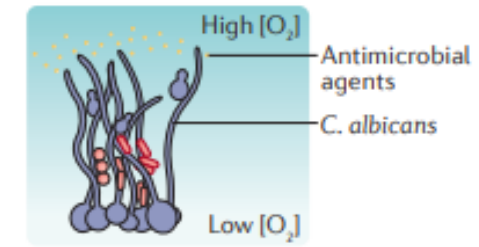
- Oral cavity**
C. albicans interacts with:
 - *Staphylococcus aureus*
 - *Streptococcus* spp. (*S. mutans*, *S. salivaris*, *S. gordonii*)
 - *Porphyromonas gingivalis*
 - *Aggregatibacter actinomycetemcomitans*
 - *Acinetobacter baumannii*
- Lungs**
C. albicans interacts with:
 - *Pseudomonas aeruginosa*
 - *Burkholderia cenocepacia*
 - *Mycobacterium tuberculosis*
- Gastrointestinal tract**
C. albicans interacts with:
 - *Escherichia coli*
 - *Helicobacter pylori*
 - *Enterococcus faecalis*
 - *Salmonella* spp.
- Vulvovaginal**
C. albicans interacts with:
 - *Lactobacillus* spp.
- Implanted medical devices**
C. albicans interacts with:
 - *S. aureus*
 - *E. coli*
 - *P. aeruginosa*
 - *Staphylococcus epidermidis*
 - *E. faecalis*
- Skin**
C. albicans interacts with:
 - *S. aureus*
 - *S. epidermidis*
- Skin (burn wound)**
C. albicans interacts with:
 - *P. aeruginosa*
 - *S. aureus*



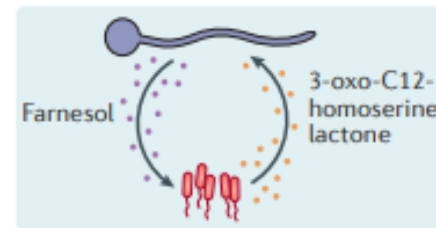
b Physical interactions



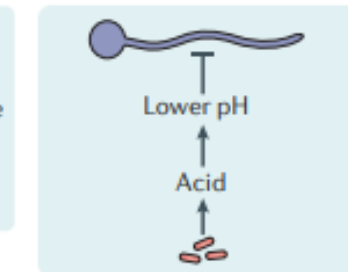
c Synergistic relationship



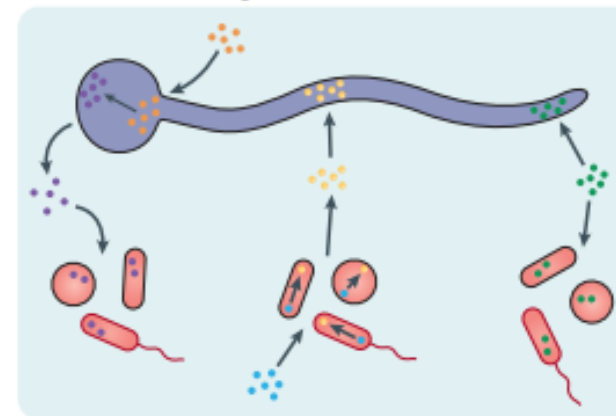
d Signalling



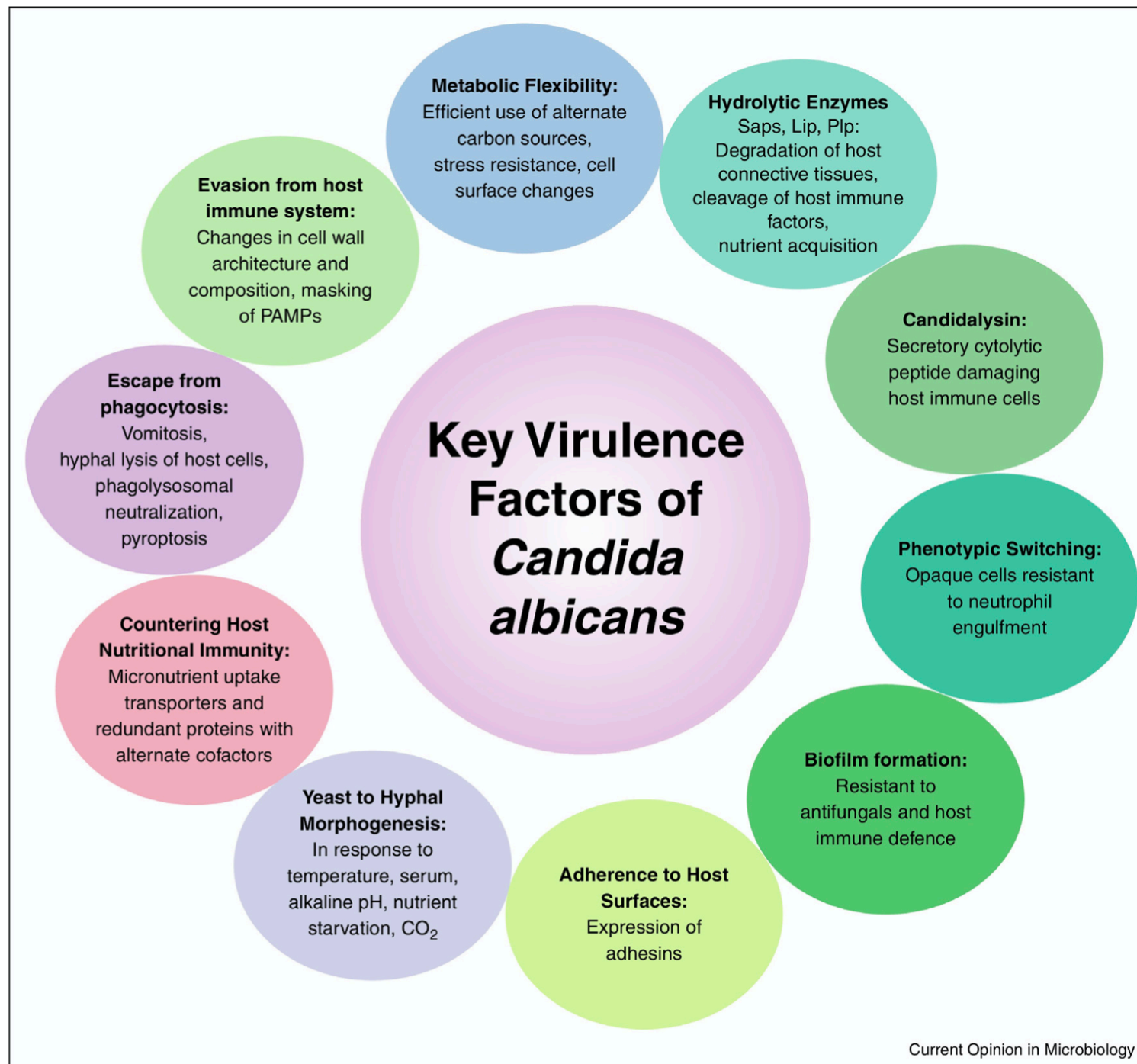
e Antagonistic relationship



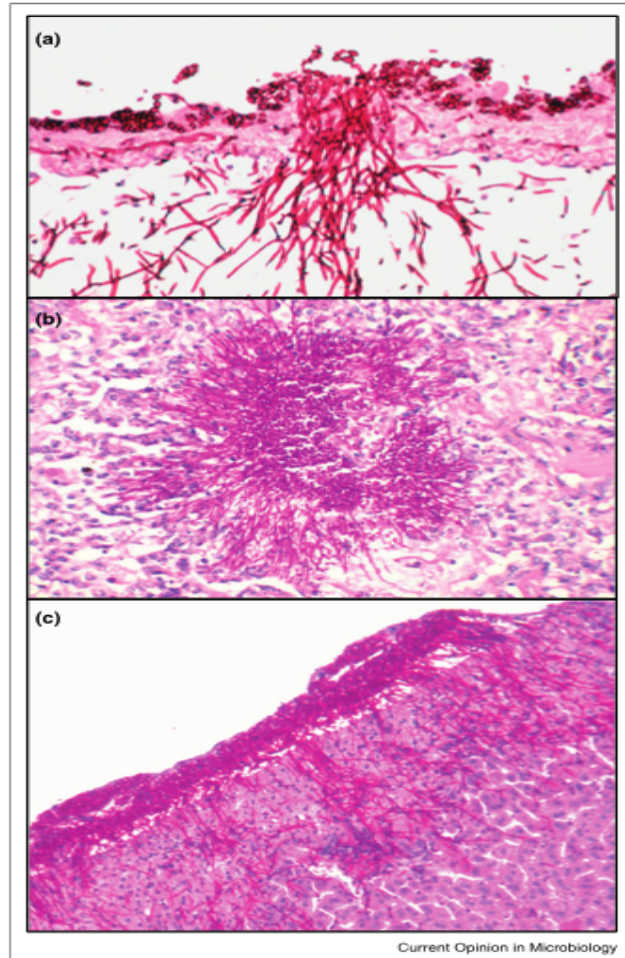
f Nutrient exchange



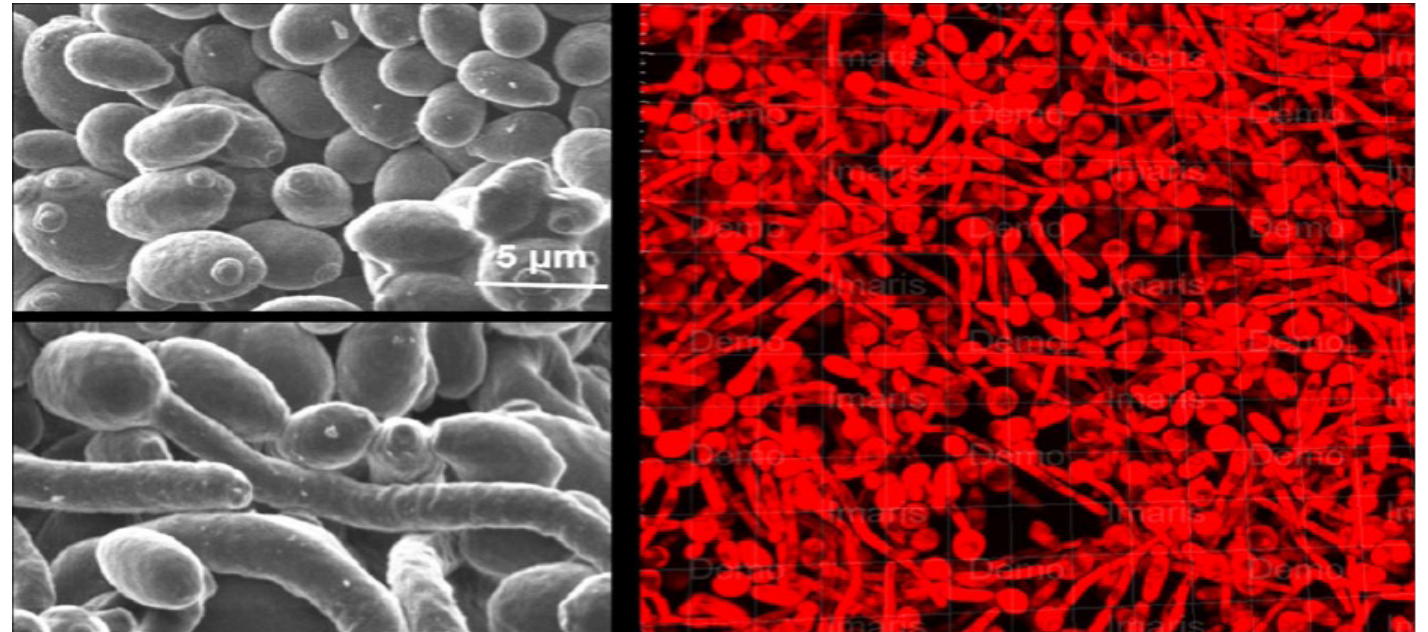
Factores de virulencia de *C. albicans*



Transición fenotípica de *C. albicans*



TOMADO DE:Gow & Hube, Current Opinion in Microbiology 2012



TOMADO DE :Journal of Oral Microbiology 2013. 5: 1-8

Transición fenotípica: Hifas penetran los tejidos del hospedero, se secretan enzimas.

Resistencia a anti-fúngicos



WHAT YOU NEED TO KNOW

- Only three classes of antifungal drugs are available to treat severe *Candida* infections: azoles, echinocandins, and amphotericin B.
- *Candida* species commonly cause bloodstream infections in hospitalized patients. About one in four of these patients die.
- *Candida* species also cause common yeast infections, which can affect the mouth, skin, and vagina, resulting in more than 3.6 million U.S. healthcare visits each year, and \$3 billion estimated direct medical costs.
- Antibiotics used to treat bacterial infections increase the risk of *Candida* infections.

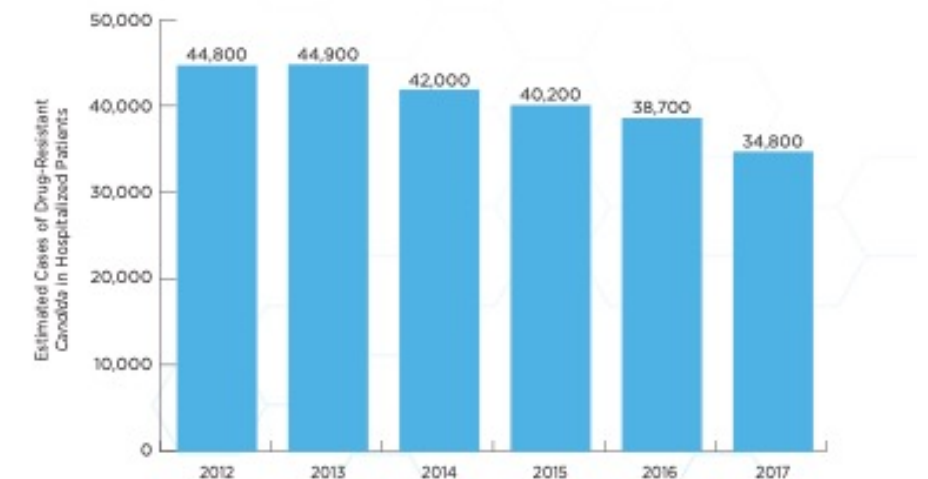
All data represented excludes *C. auris*.



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CASES OVER TIME

Resistant *Candida* are commonly detected in hospitalized patients. About 7% of bloodstream infections are resistant to antifungals.



DRUG-RESISTANT **CANDIDA SPECIES**

THREAT LEVEL **SERIOUS**



34,800

Estimated cases
in hospitalized
patients in 2017

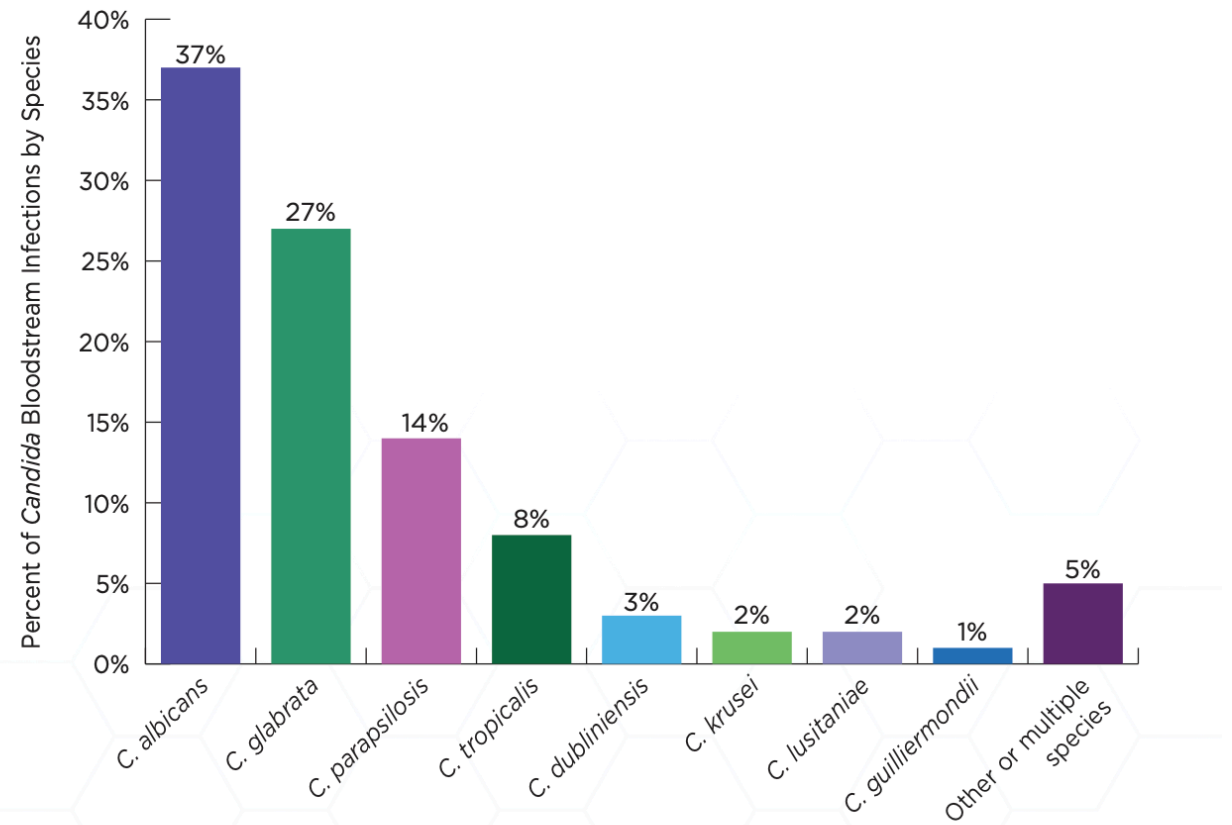


1,700

Estimated
deaths in
2017

BLOODSTREAM INFECTIONS

Candida species are a common cause of bloodstream infections and can be drug-resistant and difficult to treat.



DRUG-RESISTANT **CANDIDA AURIS**

THREAT LEVEL **URGENT**



323

Clinical cases
in 2018



90%

Isolates resistant to at
least **one** antifungal

30%

Isolates resistant to at
least **two** antifungals

Candida auris (*C. auris*) is an emerging multidrug-resistant yeast (a type of fungus). It can cause severe infections and spreads easily between hospitalized patients and nursing home residents.

WHAT YOU NEED TO KNOW

- *C. auris*, first identified in 2009 in Asia, has quickly become a cause of severe infections around the world.
- *C. auris* is a concerning drug-resistant fungus:
 - Often multidrug-resistant, with some strains (types) resistant to all three available classes of antifungals
 - Can cause outbreaks in healthcare facilities
 - Some common healthcare disinfectants are less effective at eliminating it
 - Can be carried on patients' skin without causing infection, allowing spread to others

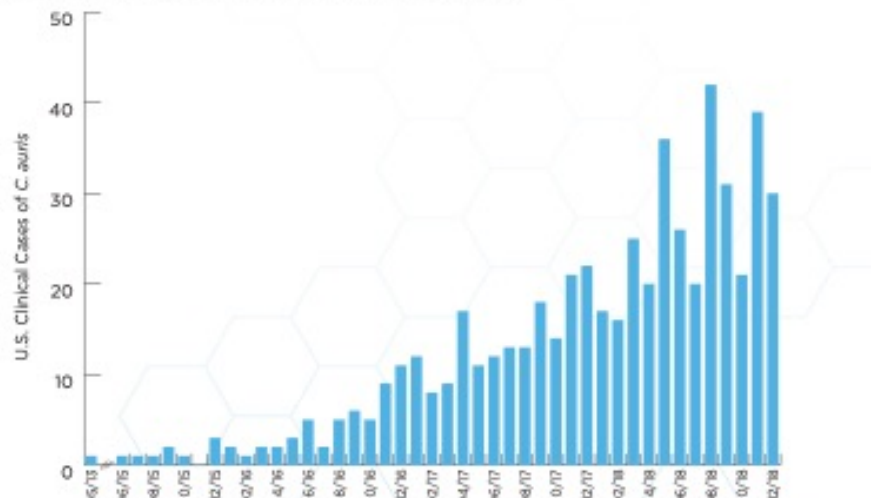
Data represents U.S. cases only. Isolates are pure samples of a germ.



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Control and Prevention

CASES OVER TIME

C. auris began spreading in the United States in 2015. Reported cases increased 318% in 2018 when compared to the average number of cases reported in 2015 to 2017.



DRUG-RESISTANT **CANDIDA AURIS**

THREAT LEVEL **URGENT**



323

Clinical cases
in 2018

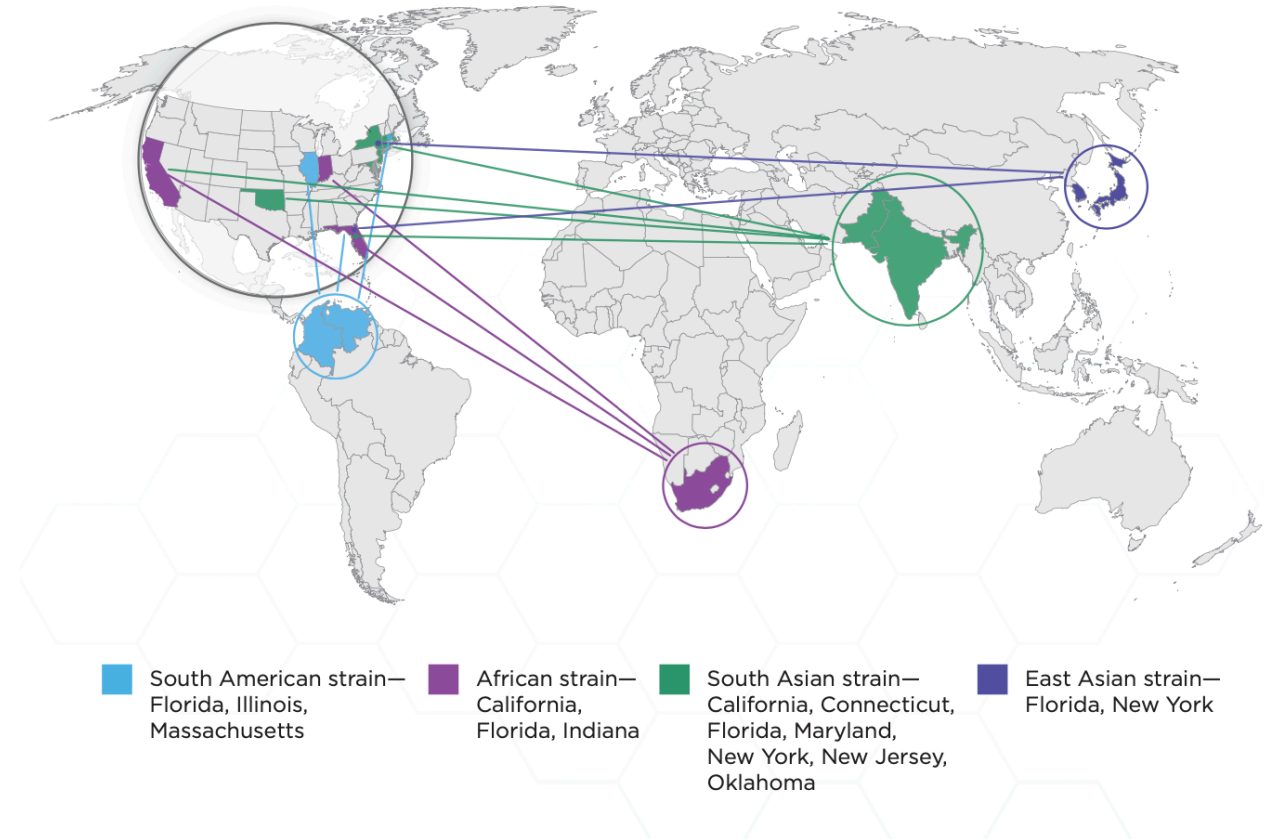


90% Isolates resistant to at least **one** antifungal

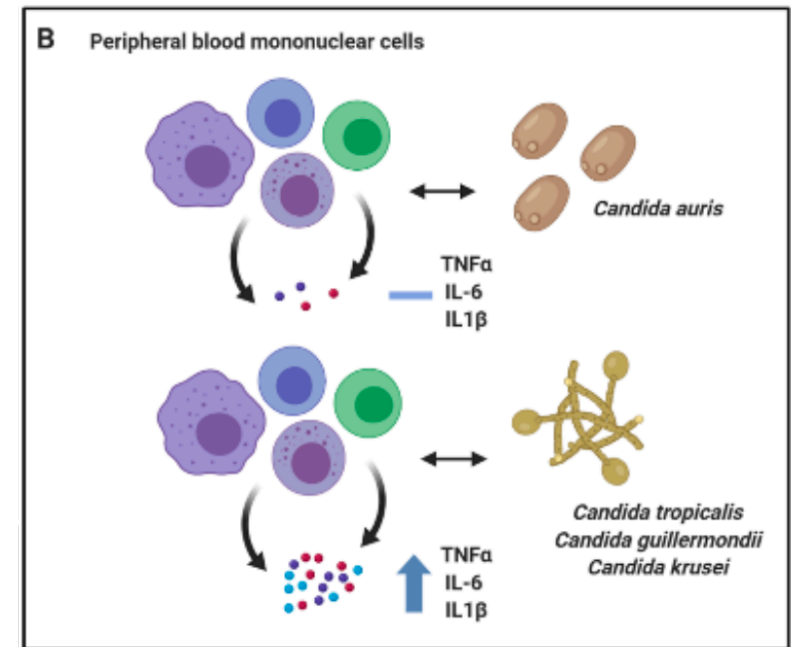
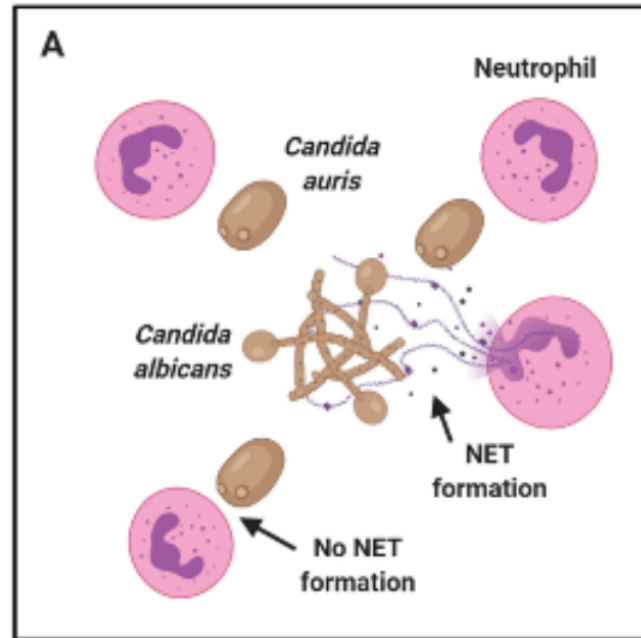
30% Isolates resistant to at least **two** antifungals

A GLOBAL THREAT

Investigators still do not know why four different strains of *C. auris* emerged around the same time across the globe. All four strains have been found in the United States, likely introduced through international travel and subsequent spread in U.S. healthcare facilities.



Evasión diferencial
del sistema
inmune por parte
de *Candida auris*



The background of the image is a soft, light pink color with a subtle, repeating pattern of stylized flowers and leaves. The flowers are rendered in a slightly darker shade of pink, and the leaves are a muted, dusty rose color. The overall aesthetic is gentle and feminine.

Fin de la clase